FOUR-HINGED WIPER ARM FOR A WINDSHIELD WIPER SYSTEM (cap, centers no underlining)

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BACKGROUND

The invention pertains to a four-hinged wiper arm for a windshield wiper system, especially for an automobile, wherein a connecting rod is connected to a driving arm at a first bearing point and to a control arm at a second bearing point so that it can pivot, a hinged part is coupled to the connecting rod, and a wiper blade that can be placed on the hinged part or on a wiper rod connected to the hinged part can be pressed against the windshield to be wiped by a spring element that is mounted on the four-hinged wiper arm.

A four-hinged wiper arm of this kind has already become known from DE 42 14 679 A1. In this wiper arm, the connecting rod is connected to a driving arm at a first bearing point by means of a cylinder bolt so that it can pivot, and it is connected to a control arm at a second bearing point by means of a cylinder bolt so that it can pivot, wherein the cylinder bolts are each mounted directly in a bearing hole of the connecting rod and/or a bearing hole of the driving arm and the control arm, respectively, so that they can rotate. Bearing points of this kind can be designed with a small structural height, however , they are not suitable for transferring with high efficiency, and without free play; the large radial and axial forces occurring during operation of the wiper arm over long operating times. Even after a short operating time, interfering bearing play may occur, which, on the one hand, greatly reduces the wiping quality and, on the other hand, can result in an interfering formation of noise.

SUMMARY

The invention is based on the problem of improving a four-hinged wiper arm of the kind described above, in such a manner that the bearing points of the connecting rod with the driving arm and the control arm, respectively, satisfy the strict requirements, over the long term, with regard to high-efficiency, non-play transmission of large radial and axial forces.

In the case of a four-hinged wiper arm [with the properties of the preamble of Claim 1, the problem is solved] according to this invention [in that the] connecting rod or the driving arm or the control arm is provided with a rolling-contact bearing on at least one of the two bearing points of the four-hinged wiper arm. Just the provision of

one of the two bearing points with a rolling-contact bearing enables a more rigid and more exact control of the connecting rod over a longer operating time, in particular, when the bearing point of the connecting rod with the driving arm is equipped with a rolling-contact bearing. This will ensure good wiping quality and less noisy movement of the windshield wiper system over longer operating times.

In order to ensure a non-play bearing over a long operating time, even under very large radial and axial forces to be transferred, in the embodiment of the invention according to Claim 2, it is recommended to use a design such that at least one of the rolling-contact bearings is a deep groove ball bearing. Due to their design configuration, deep groove ball bearings are particularly well-suited for non-play transmission of large radial and axial forces.

However, a favorable embodiment of the invention according to ~~Claim~~ 8 provides that the four-hinged wiper arm is equipped with a rolling-contact bearing, preferably with a deep groove ball bearing, both at the first bearing point of the connecting rod (1) with the driving arm, and also at the second bearing point of the connecting rod with the control rod. Bearing points designed in this manner can withstand large forces in the axial and radial direction over long periods of time with no damage, so that a four-hinged wiper arm designed in this manner can satisfy the significant requirements with regard to good wiping quality and low-noise operation over very long operating times.

BRIEF DESCRIPTION OF THE DRAWINGS

Additional favorable embodiments result from the subordinate claims, and other advantages and details of the invention will be explained in greater detail below with reference to the figures which describe one particular embodiment example. The In the accompanying figures show:

Figure 1 is a four-hinged wiper arm and

Figure 2 is a vertical cross section along line II-II in Figure 1 through the connecting rod and the two bearing points.

DETAILED DESCRIPTION

The four-hinged wiper arm shown schematically in Figure 1 has the essential components of the four-hinged construction consisting of connecting rod 1 with a first bearing point 2 and a second bearing point 3. The connecting rod 1 is pivotally mounted at the first bearing point 2 to one end of a driving arm 4 so that it can pivot about the first bearing point 2 and the The connecting rod 1 is also pivotally connected at the second bearing point 3 to one end of a

control arm 5 so that it can pivot. The other end of the driving arm 4 is attached to a pendulum-driveable wiper shaft (not shown) which is arranged in a chassis-mounted wiper bearing so that it can rotate, and the other end of the control arm 5 is fixed to a control shaft, which is arranged in a likewise chassis-mounted bearing so that it can rotate. Thus, an articulated rectangle is formed by the connecting rod 1, the driving arm 4, the control arm 5 and a chassis-mounted part of the vehicle running between the free ends of the driving arm 4 and the control arm 5.

In Figure 1, the connecting rod 1 is extended to the left past the bearing point 3. At this end a hinged part 7 is coupled to the connecting rod 1 so that it can pivot about an axis 6 running parallel to the windshield to be wiped. As an extension of the hinged part 7, a wiper rod 8 attached to the hinged part 7 can be seen; this wiper rod is designed in a known manner with a free end for connection to a wiper blade (not illustrated). It is essential to the invention that at each of the two bearing points 2 and 3 of the connecting rod 1, there is one rolling-contact bearing 9 in the form of a deep groove ball bearing 11 for the pivotable connection between the connecting rod 1 and the driving arm 4 and the control arm 5, respectively.

Additional details of the invention are visible from the enlarged, schematic illustration (with respect to Figure 1) that is presented in Figure 2. The connecting rod 1 shown in Figure 2 consists of metal and, in the region of the first bearing point 2 and in the region of the second bearing point 3, it has essentially the same design. The only difference consists in that the connecting rod 1 is connected to the driving arm 4 at the first bearing point 2 so that it can pivot and it is connected to the control arm 5 at the second bearing point 3 so that it can also pivot. At the two bearing points 2 and 3, the connecting rod 1 has a recess 10 into which the outer ring of a deep groove ball bearing 11 is fit. The fit is structured so that the deep groove ball bearing 11 is axially fixed in the recess 10 and will not turn. For a particularly dependable axial mount, the edges of the recess 10 are caulked locally or around the perimeter. In this regard, it should be pointed out that the deep groove ball bearing 11 is shown only schematically in the drawing for reasons of simplicity. Since deep groove ball bearings are a standard part already known in the technical world, a more detailed illustration and description can be omitted at this point.

In the event that the connecting rod 1 is made of a plastic material, the at least one rolling-contact bearing 9 or deep groove ball bearing 11 can be injection molded into the connecting rod 1.

It is clearly evident, in particular in Figure 1, that the connection between the driving arm 4 or the control arm 5 and the connecting rod 1 takes place by means of a riveted bolt 12. The upper end of the riveted bolt 12 is fit into the inner ring of the deep groove ball bearing 11, and the lower end of the riveted bolt 12 is fit into a passage 13 in the driving arm 4 or the control arm 5. Whereas in the middle region of the riveted bolt 12 there is a narrow, radially protruding flange 14 whose one side rests against the inner ring of the deep groove ball bearing 11 and whose other side rests against the driving arm 4 or control arm 5, the opposing ends of the riveted bolt are each mounted in place axially by wobble riveting and are connected rotation-tight to the inner ring of the deep groove ball bearing 11 or to the driving arm 4 or control arm 5 so that they do not rotate. Due to the flange 14 of the riveted bolt 12, on the one hand, the spacing between the driving arm 4 or control arm 5 and the connecting rod 1--necessary for mobility--will be assured, and on the other hand, a stable connection of the riveted bolt 12 to the deep groove ball bearing 11 and to the driving arm 4 or control arm 5 will be assured.

In the described four-hinged wiper arm, both the driving arm 4 and also the control arm 5 are manufactured as stamped sheet metal parts. The advantage of this is that the four-hinged wiper arm, in particular in the region of the four-hinged construction, can be produced at a small structural height. However, the connecting rod l has a greater thickness than the driving arm 4 or control arm 5. On the other hand, since the rolling-contact bearing 9 or deep groove ball bearing 11 necessarily must have a particular structural height, it is an advantage to fix the rolling-contact bearing 9 or deep groove ball bearing 11 to the connecting rod 1. This will assure a dependable and stable mount of the rolling-contact bearing 9 or deep groove ball bearing 11 to the connecting rod 1. With a different design of the driving arm 4 or the control arm 5 with sufficient thickness in the region of the bearing point 2 or 3, for example, as a cast metal part or as an injection molded plastic part, the corresponding rolling-contact bearing 9 or deep groove ball bearing 11 can also be held against the

driving arm 4 or control arm 5, whereas the bolt 12, on the other hand, is directly mounted to the connecting rod 1.

When using a riveted bolt 12 to generate the connection between the connecting rod 1 and the driving arm 4 or control arm 5 by means of a rolling-contact bearing 9 or deep groove ball bearing 11, a cost-effective assembly or manufacture can be obtained by means of wobble riveting. With wobble riveting of the riveted bolt 12 on both sides, the flange 14 formed in the middle region of the bolt 12 will ensure a good support against the forces generated during the riveting process.

Since the function and operation of a four-hinged wiper arm is generally known to a person skilled in the art, it need not be described in further detail here.

List of Reference Symbols

1	Connecting rod
2	(first) bearing point
3	(second) bearing point
4	Driving arm
5	Control arm
6	Axis
7	Hinged part
8	Wiper rod
9	Rolling-contact bearing
10	Recess
11	Deep groove ball bearing
12	Riveted bolt
13	Passage
14	Flange

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Claims What is claimed:

1. Four-hinged wiper arm for a windshield wiper system, especially for an automobile, wherein a connecting rod (1) is connected to a driving arm (4) at a first bearing point (2) and to a control arm (5) at a second bearing point (3), so that it can pivot, a hinged part (7) is coupled to the connecting rod (1), and a wiper blade that can be placed on the hinged part or on a wiper rod (8) connected to the hinged part

can be pressed against the windshield to be wiped by a spring element that is mounted on the four-hinged wiper arm, characterized in that the connecting rod (1) or the driving arm (4) or the control arm (5) is provided with a rolling-contact bearing (9) in at least one of the two bearing points (2, 3) of the four-hinged wiper arm.

2. Four-hinged wiper arm according to Claim 1, characterized in that at least one of the rolling-contact bearings (9) is a deep groove ball bearing (11).

3. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that the outer ring of the at least one rolling-contact bearing (9, 11) is axially secured and held, preferably pressed, so that it does not rotate in one recess (10) of the connecting rod (1), whereas a bolt (12) attached to the driving arm (4) or to the control arm (5) is fitted into the inner ring of the rolling-contact bearing and is axially secured and held so that it does not rotate.

4. Four-hinged wiper arm according to one of the preceding claims, characterized in that the driving arm (4) and the control arm (5) are made of sheet metal, preferably as stamped parts.

5. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that the bolt used on the at least one bearing point (2, 3) is a riveted bolt (12).

6. Four-hinged wiper arm according to Claim 5, characterized in that the riveted bolt (12), is secured, on one hand, by wobble riveting in a passage (13) of the driving arm (4) or control arm (5), and on the other hand by wobble riveting at the inner ring of the rolling-contact bearing (9, 11).

7. Four-hinged wiper arm according to Claim G, characterized in that the riveted bolt (12) has a radially protruding flange (14) in its middle region, with one side that rests against the driving arm (4) or control arm (5) and the other side rests against the front surface of the inner ring of the rolling-contact bearing (9, 11).

8. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that it is equipped with a rolling-contact bearing (9), preferably with a deep groove ball bearing (11), both at the first bearing point (2) between the connecting rod (1) and the driving arm (4), and also at the second bearing point (3) between the connecting rod (1) and the control rod (5).

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The invention pertains to a four-hinged wiper arm for a windshield wiper system, especially for an automobile, wherein a connecting rod is connected to a driving arm at a first bearing point and to a control arm at a second bearing point so that it can pivot, a hinged part is coupled to the connecting rod, and a wiper blade that can be placed on the hinged part or on a wiper rod connected to the hinged part can be pressed against the windshield to be wiped by a spring element that is mounted on the four-hinged wiper arm.

A four-hinged wiper arm of this kind has already become known from DE 42 14 679 A1. In this wiper arm, the connecting rod is connected to a driving arm at a first bearing point by means of a cylinder bolt so that it can pivot, and it is connected to a control arm at a second bearing point by means of a cylinder bolt so that it can pivot, wherein the cylinder bolts are each mounted directly in a bearing hole of the connecting rod and/or a bearing hole of the driving arm and the control arm, respectively, so that they can rotate. Bearing points of this kind can be designed with a small structural height, however, they are not suitable for transferring with high efficiency, and without free play, the large radial and axial forces occurring during operation of the wiper arm over long operating times. Even after a short operating time, interfering bearing play may occur, which on the one hand greatly reduces the wiping quality and on the other hand, can result in an interfering formation of noise.

The invention is based on the problem of improving a four-hinged wiper arm of the kind described above, in such a manner that the bearing points of the connecting rod with the driving arm and the control arm, respectively, satisfy the strict requirements, over the long term, with regard to high-efficiency, non-play transmission of large radial and axial forces.

In the case of a four-hinged wiper arm with the properties of the preamble of Claim 1, the problem is solved according to this invention in that the connecting rod or the driving arm or the control arm is provided with a rolling-contact bearing on at least one of the two bearing points of the four-hinged wiper arm. Just the provision of one of the two bearing points with a rolling-contact bearing enables a more rigid and more exact control of the connecting rod over a longer operating time, in particular when the bearing point of the connecting rod with the driving arm is equipped with a rolling-contact bearing. This will ensure good wiping quality and less noisy movement of the windshield wiper system over longer operating times.

In order to ensure a non-play bearing over a long operating time, even under very large radial and axial forces to be transferred, in the embodiment of the invention according to Claim 2 it is recommended to use a design such that at least one of the rolling-contact bearings is a deep

groove ball bearing. Due to their design configuration, deep groove ball bearings are particularly well-suited for non-play transmission of large radial and axial forces.

However, a favorable embodiment of the invention according to [Claim] 8 provides that the four-hinged wiper arm is equipped with a rolling-contact bearing, preferably with a deep groove ball bearing, both at the first bearing point of the connecting rod (1) with the driving arm, and also at the second bearing point of the connecting rod with the control rod. Bearing points designed in this manner can withstand large forces in the axial and radial direction over long periods of time with no damage, so that a four-hinged wiper arm designed in this manner can satisfy the significant requirements with regard to good wiping quality and low-noise operation over very long operating times.

Additional favorable embodiments result from the subordinate claims, and other advantages and details of the invention will be explained in greater detail below with reference to the figures which describe one particular embodiment example. The accompanying figures show:

Figure 1, a four-hinged wiper arm and

Figure 2, a vertical cross section along line II-II in Figure 1 through the connecting rod and the two bearing points.

The four-hinged wiper arm shown schematically in Figure 1 has the essential components of the four-hinged construction consisting of connecting rod 1 with a first bearing point 2 and a second bearing point 3. The connecting rod 1 is pivotally mounted at the first bearing point 2 to one end of a driving arm 4 so that it can pivot, and the connecting rod 1 is connected at the second bearing point 3 to one end of a control arm 5 so that it can pivot. The other end of the driving arm 4 is attached to a pendulum-driveable wiper shaft (not shown) which is arranged in a chassis-mounted wiper bearing so that it can rotate, and the other end of the control arm 5 is fixed to a control shaft, which is arranged in a likewise chassis-mounted bearing so that it can rotate. Thus, an articulated rectangle is formed by the connecting rod 1, the driving arm 4, the control arm 5 and a chassis-mounted part of the vehicle running between the free ends of the driving arm 4 and the control arm 5.

In Figure 1 the connecting rod 1 is extended to the left past the bearing point 3. At this end a hinged part 7 is coupled to the connecting rod 1 so that it can pivot about an axis 6 running parallel to the windshield to be wiped. As an extension of the hinged part 7, a wiper rod 8 attached to the hinged part 7 can be seen, this wiper rod is designed in a known manner with a free end for connection to a wiper blade (not illustrated). It is essential to the invention that at each of the two bearing points 2 and 3 of the connecting rod 1, there is one rolling-contact bearing 9 in the form of a deep groove ball bearing 11 for the pivotable connection between the connecting rod 1 and the driving arm 4 and the control arm 5, respectively.

Additional details of the invention are visible from the enlarged, schematic illustration (with respect to Figure 1) that is presented in Figure 2. The connecting rod 1 shown in Figure 2 consists of metal and in the region of the first bearing point 2 and in the region of the second bearing point 3, it has essentially the same design. The only difference consists in that the connecting rod 1 is connected to the driving arm 4 at the first bearing point 2 so that it can pivot and it is connected to the control arm 5 at the second bearing point 3 so that it can pivot. At the two bearing points 2 and 3, the connecting rod 1 has a recess 10 into which the outer ring of a deep groove ball bearing 11 is fit. The fit is structured so that the deep groove ball bearing 11 is axially fixed in the recess 10 and will not turn. For a particularly dependable axial mount, the edges of the recess 10 are caulked locally or around the perimeter. In this regard, it should be pointed out that the deep groove ball bearing 11 is shown only schematically in the drawing for reasons of simplicity. Since deep groove ball bearings are a standard part already known in the technical world, a more detailed illustration and description can be omitted at this point.

In the event that the connecting rod 1 is made of a plastic material, the at least one rolling-contact bearing 9 or deep groove ball bearing 11 can be injection molded into the connecting rod 1.

It is clearly evident, in particular in Figure 1, that the connection between the driving arm 4 or the control arm 5 and the connecting rod 1 takes place by means of a riveted bolt 12. The upper end of the riveted bolt 12 is fit into the inner ring of the deep groove ball bearing 11, and the lower end of the riveted bolt 12 is fit into a passage 13 in the driving arm 4 or the control arm 5. Whereas in the middle region of the riveted bolt 12 there is a narrow, radially protruding flange 14 whose one side rests against the inner ring of the deep groove ball bearing 11 and whose other side rests against the driving arm 4 or control arm 5, the opposing ends of the riveted bolt are each mounted in place axially by wobble riveting and are connected rotation-tight to the inner ring of the deep groove ball bearing 11 or to the driving arm 4 or control arm 5 so that they do not rotate. Due to the flange 14 of the riveted bolt 12, on the one hand, the spacing between the driving arm 4 or control arm 5 and the connecting rod 1--necessary for mobility--will be assured, and on the other hand, a stable connection of the riveted bolt 12 to the deep groove ball bearing 11 and to the driving arm 4 or control arm 5 will be assured.

In the described four-hinged wiper arm, both the driving arm 4 and also the control arm 5 are manufactured as stamped sheet metal parts. The advantage of this is that the four-hinged wiper arm, in particular in the region of the four-hinged construction, can be produced at a small structural height. However, the connecting rod 1 has a greater thickness than the driving arm 4 or control arm 5. On the other hand, since the rolling-contact bearing 9 or deep groove ball bearing 11 necessarily must have a particular structural height, it is an advantage to fix the rolling-contact bearing 9 or deep groove ball bearing 11 to the connecting rod 1. This will assure a dependable

and stable mount of the rolling-contact bearing 9 or deep groove ball bearing 11 to the connecting rod 1. With a different design of the driving arm 4 or the control arm 5 with sufficient thickness in the region of the bearing point 2 or 3, for example, as a cast metal part or as an injection molded plastic part, the corresponding rolling-contact bearing 9 or deep groove ball bearing 11 can also be held against the driving arm 4 or control arm 5, whereas the bolt 12, on the other hand, is directly mounted to the connecting rod 1.

When using a riveted bolt 12 to generate the connection between the connecting rod 1 and the driving arm 4 or control arm 5 by means of a rolling-contact bearing 9 or deep groove ball bearing 11, a cost-effective assembly or manufacture can be obtained by means of wobble riveting. With wobble riveting of the riveted bolt 12 on both sides, the flange 14 formed in the middle region of the bolt 12 will ensure a good support against the forces generated during the riveting process.

Since the function and operation of a four-hinged wiper arm is generally known to a person skilled in the art, it need not be described in further detail here.

List of Reference Symbols

1	Connecting rod
2	(first) bearing point
3	(second) bearing point
4	Driving arm
5	Control arm
6	Axis
7	Hinged part
8	Wiper rod
9	Rolling-contact bearing
10	Recess
11	Deep groove ball bearing
12	Riveted bolt
13	Passage
14	Flange

Claims

1. Four-hinged wiper arm for a windshield wiper system, especially for an automobile, wherein a connecting rod (1) is connected to a driving arm (4) at a first bearing point (2) and to a control arm (5) at a second bearing point (3), so that it can pivot, a hinged part (7) is coupled to the connecting rod (1), and a wiper blade that can be placed on the hinged part or on a wiper rod

(8) connected to the hinged part can be pressed against the windshield to be wiped by a spring element that is mounted on the four-hinged wiper arm, characterized in that the connecting rod (1) or the driving arm (4) or the control arm (5) is provided with a rolling-contact bearing (9) in at least one of the two bearing points (2, 3) of the four-hinged wiper arm.

2. Four-hinged wiper arm according to Claim 1, characterized in that at least one of the rolling-contact bearings (9) is a deep groove ball bearing (11).

3. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that the outer ring of the at least one rolling-contact bearing (9, 11) is axially secured and held, preferably pressed, so that it does not rotate in one recess (10) of the connecting rod (1), whereas a bolt (12) attached to the driving arm (4) or to the control arm (5) is fitted into the inner ring of the rolling-contact bearing and is axially secured and held so that it does not rotate.

4. Four-hinged wiper arm according to one of the preceding claims, characterized in that the driving arm (4) and the control arm (5) are made of sheet metal, preferably as stamped parts.

5. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that the bolt used on the at least one bearing point (2, 3) is a riveted bolt (12).

6. Four-hinged wiper arm according to Claim 5, characterized in that the riveted bolt (12), is secured, on one hand, by wobble riveting in a passage (13) of the driving arm (4) or control arm (5), and on the other hand by wobble riveting at the inner ring of the rolling-contact bearing (9, 11).

7. Four-hinged wiper arm according to Claim 6, characterized in that the riveted bolt (12) has a radially protruding flange (14) in its middle region, with one side that rests against the driving arm (4) or control arm (5) and the other side rests against the front surface of the inner ring of the rolling-contact bearing (9, 11).

8. Four-hinged wiper arm according to at least one of the preceding claims, characterized in that it is equipped with a rolling-contact bearing (9), preferably with a deep groove ball bearing (11), both at the first bearing point (2) between the connecting rod (1) and the driving arm (4), and also at the second bearing point (3) between the connecting rod (1) and the control rod (5).